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# Three-dimensional Nanofiber Cathode for Low Temperature and High Temperature Fuel Cells

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Electrochemical devices for clean energy conversion such as proton exchange membrane fuel cells<sup>1-3</sup> and solid oxide fuel cells<sup>4-5</sup> are currently and for the foreseeable future very much in the spotlight. Although these developing energy technologies have seen a rapid development, new break-through developments are needed to improve their durability, efficiency, power density and cost to make them commercial viable. Among those energy-related devices, functional ion-conductive membranes and electrodes play crucial roles in determining electrochemical reaction rate, system degradation and integration, which depend intimately on the properties of their materials.

Nanostructured materials are becoming increasingly important for electrochemical conversion and storage devices in recent years because of the unusual mechanical, electrical and optical properties endowed by confining the dimensions of such materials and because of the combination of bulk and surface properties to the overall behavior. The greatest advantage of electrospinning is the possibility of generating composite networks from a rich variety of materials with the ability to control composition, morphology and secondary structure which allows design of optimum material characteristics for membranes. This simple and versatile method has been used in this research to address the sizable challenges facing those involved in materials research into energy conversion devices.

Herein, we present initial results on 1) electrolyte/catalysts composite electrodes for proton exchange membrane fuel cells; 2) Ceramic nanofiber cathode for solid oxide fuel cells. Enhancements in electrochemical performance, mechanical properties and durability were clearly seen and related to this unique three-dimensional networks of nanofibers, which increases gas accesability, optimizes three-phase boundary and improves water management on the cathode side.

**Key Words:** electrospinning, nanofiber, electrode, fuel cells.

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